
User Manual M1

Standard signal 0/4-20 mA, 0-10 V



Technical features:

- red display of -1999...9999 digits (optional: green, orange or blue display)
- minimal installation depth: from 63 mm with plug-in terminal
- adjustment via factory default or directly on the sensor signal
- min-/max-value recording
- 10 adjustable setpoints
- display flashing at threshold exceedance or undershooting
- tara- / offset value calibration
- programming interlock via access code
- protection class IP65 at the front
- plug-in screw terminal
- pc-based configuration software PM-TOOL for devices without keypad, for a simple adjustment of standard devices

Identification

STANDARD TYPES	ORDER NUMBER
Direct voltage, current	M1-3VR4B.0001.570AD
Housing size: 96x24 mm	M1-3VR4B.0001.770AD

Options – breakdown of order code:

	M	1	3	V	R	4	B.	0	0	0	1.	7	7	0	A	D	
Standard type M-Line																	Dimension
																	D physical unit
Installation depth																	Version
74 mm																	A Standard
incl. plug-in terminal																	B Installation depth 63 mm only with 24 VDC supply
Housing size																	Setpoints
96x24x60 mm																	0 no setpoints
(without plug-in terminal)																	Protection class
Display type																	1 without keypad, operation on the back
Current, voltage																	7 IP65 / plug-in terminal
Display colours																	Voltage supply
Blue																	5 230 VAC
Green																	7 24 VDC galv. insulated
Red																	Measuring input
Orange																	1 Standard signal 0/4-20 mA, 0-10 VDC
Number of digits																	Analog output
4-digit																	0 without
Digit height																	Sensor supply
14 mm																	0 without
Interface																	
without																	

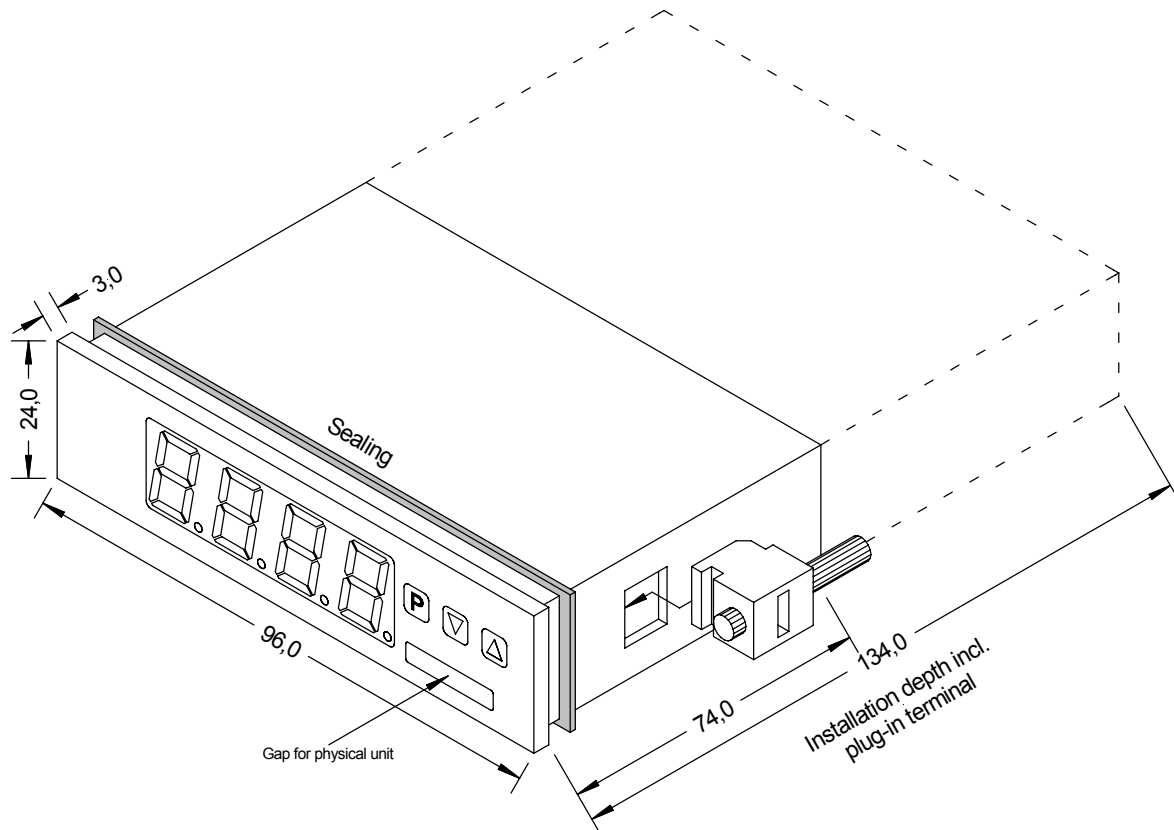
Please state physical unit by order, e.g. m/min.

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1. Assembly

Please read the *Safety advice* on *page 16* before installation and keep this user manual for future reference.



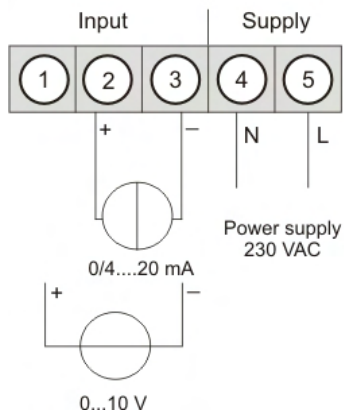
1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.

CAUTION! The torque should not exceed 0.1 Nm!

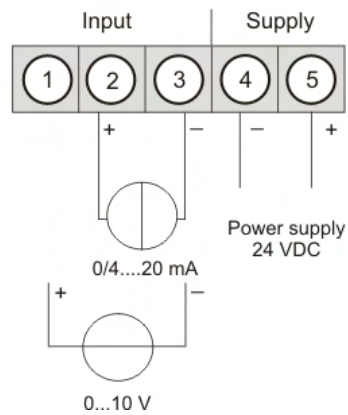
The dimension symbols can be exchanged before installation via a channel on the side!

2. Electrical connection

Type M1-3VR4B.0001.570AD
with a supply of 230 VAC



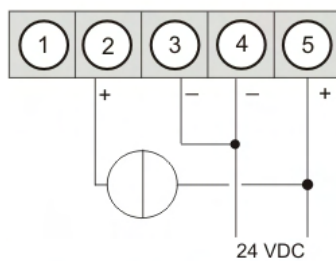
Type M1-3VR4B.0001.770AD
with a supply of 24 VDC



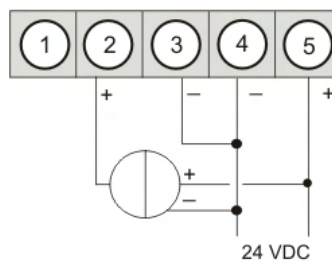
Connection examples:

Below you find some connection examples, which demonstrate some practical applications:

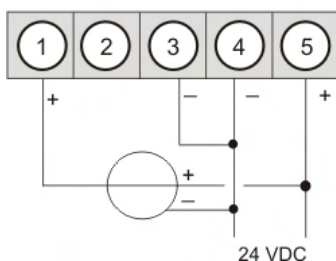
M1 in combination with a
2-wire sensor of 4-20 mA



M1 in combination with a
3-wire sensor of 0/4-20 mA



M1 in combination with a
3-wire sensor of 0-10 V



3. Function and operation description

Operation

The operation is divided into two different levels.

Menu Level







Here it is possible to navigate between the individual menu items.

Parameterization level:

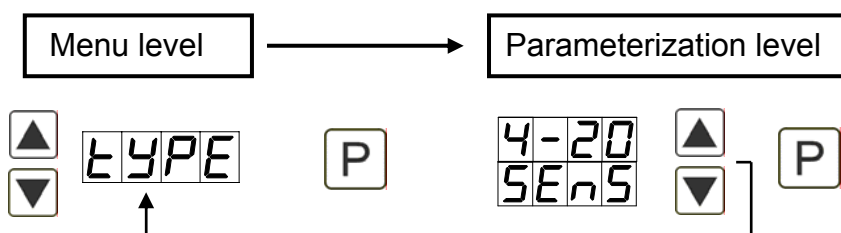
The parameters stored in the menu item can be parameterized here.

Functions that can be adjusted or changed are always indicated with a flashing of the display. Adjustments made at the parameterization level should be always confirmed by pressing the **[P]** key to save them.

However, the display automatically saves all adjustments and then switches to operation mode if no further keys are pressed within 10 seconds.

Level	Button	Description
Menu level		Change to parameterization level with the relevant parameters
	 	For navigation at the menu level
Parameterization level		To confirm the changes made at the parameterization level
	 	To change the value or setting

Example:



Programming via configuration software PM-TOOL-MUSB6

You receive the software on CD incl. an USB-cable with a device adaptor. The connection is done via a 6-pole micromatch connector plug on the back and the PC is connected via an USB connector plug.

System requirements: PC with USB interface

Software: Windows XP, Windows Vista

4. Setting up the device

4.1. Switching on

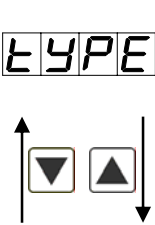
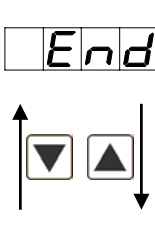
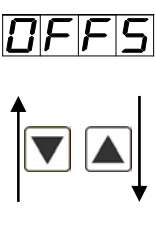
Once the installation is complete, you can start the device by applying the current loop. Check beforehand once again that all the electrical connections are correct.

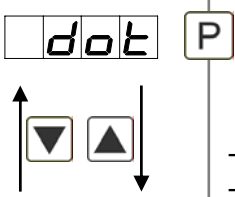

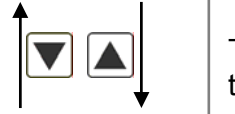
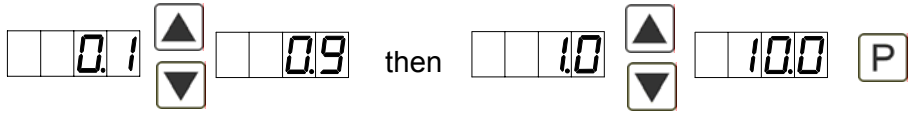
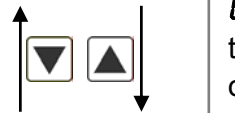
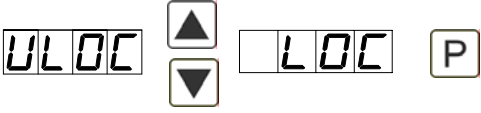
Starting sequence

For 1 second during the switching-on process, the segment test (**8 8 8 8**) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the start-up sequence, the device switches to operation/display mode.

4.2. Standard parameterization:

To be able to parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes to the menu level with the first menu item **TYPE**.

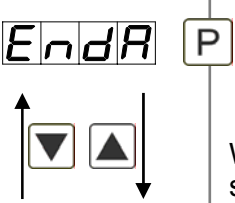

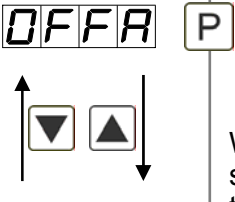

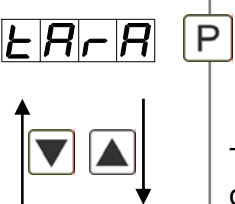

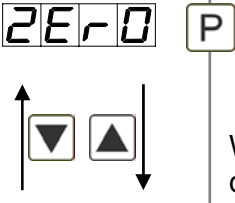

Menu level	Parameterization level
	<p>Selection of the input signal, <i>TYPE</i>:</p> <p>There are several measuring inputs options: 0/4-20 mA or 0-10 VDC signals as the works calibration (without application of the sensor signal) and SENS as the sensor calibration (with the sensor applied). Confirm the selection with [P] and the display switches back to menu level.</p>
	<p>Setting the measuring range end value, <i>END</i>:</p> <p>Set the end value from the smallest to the highest digit with [▲] [▼] and confirm each digit with [P]. A minus sign can only be parameterized on the highest value digit. After the last digit, the display switches back to the menu level. If SENS was selected as the input option, you can only select between NOCA and CAL. With NOCA, only the previously set display value is taken over, and with CAL, the device takes over both the display value and the analogue input value.</p>
	<p>Setting the measuring range start/offset value, <i>OFFS</i>:</p> <p>Enter the start/offset value from the smallest to the highest digit [▲] [▼] and confirm each digit with [P]. After the last digit the display switches back to the menu level. If SENS was selected as the input option, you can only select between NOCA and CAL. With NOCA, only the previously set display value is taken over, and with CAL, the device takes over both the display value and the analogue input value.</p>





















Menu level	Parameterization level
	<p>Setting the decimal point, <i>DOT</i>:</p>  <p>The decimal point on the display can be moved with [\blacktriangle] [\blacktriangledown] and confirmed with [P]. The display then switches back to the menu level again.</p>
	<p>Setting the display time, <i>SEC</i>:</p>  <p>The display time is set with [\blacktriangle] [\blacktriangledown]. The display moves up in increments of 0.1 sec up to 1 second and in increments of 1.0 sec to 10.0 seconds. Confirm the selection by pressing the [P] button. The display then switches back to the menu level again.</p>
	<p>Activation / deactivation of the programming lock and completion of the standard parameterization, <i>RUN</i>:</p>  <p>With the aid of the [\blacktriangle] [\blacktriangledown] keys, you can choose between the deactivated key lock ULOC (works setting) and the activated key lock LOC. Make the selection with [P]. After this, the display confirms the settings with "- - -", and automatically switches to operating mode. If LOC was selected, the keyboard is locked. To get back into the menu level, you must press [P] for 3 seconds in operating mode. You must now enter the CODE (works setting 1 2 3 4) that appears using the [\blacktriangle] [\blacktriangledown] keys plus [P] to unlock the keyboard. FAIL appears if the input is wrong.</p>






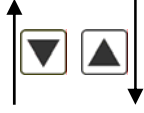






4.3. Extended parameterization

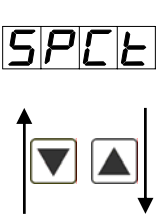

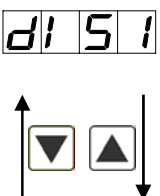

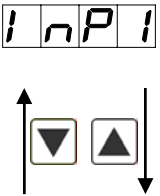

By pressing the [▲] & [▼] buttons during standard parameterization for one second, the display switches to the extended parameterization mode.

Operation is the same as in standard parameterization.

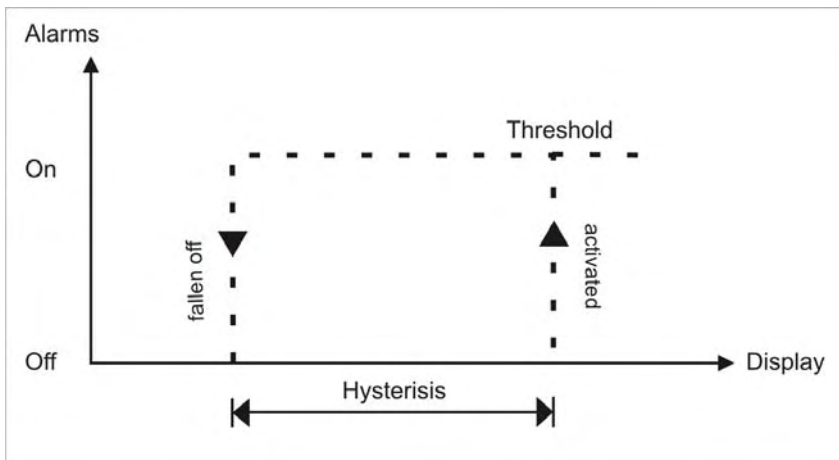
Menu level	Parameterization
	<p>Rescaling the measuring input values, <i>ENDAR</i>:</p> <p>  </p> <p>With the aid of this function, you can rescale the input value of e.g. 19,5 mA (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.</p>
	<p>Rescaling the measuring input values, <i>OFFAR</i>:</p> <p>  </p> <p>With the aid of this function, you can rescale the input value of e.g. 3,5 mA (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.</p>
	<p>Setting the tare/offset value, <i>TARR</i>:</p> <p>  </p> <p>The given value is added to the linearized value. In this way, the characteristic line can be shifted by the selected amount.</p>
	<p>. Zero point slowdown, <i>ZERO</i>:</p> <p>  </p> <p>With zero point slowdown, a value range around zero can be preselected at which the display shows zero. If, for example, a 10 is set, the display would show a zero in the range from -10 to +10 and continue below it with -11 and above it with +11.</p>

Menu level	Parameterization level
<div data-bbox="124 409 280 461">LAST</div> <div data-bbox="308 409 355 461">P</div> <div data-bbox="135 499 276 607">  </div>	<p>4.3.1. MIN/MAX value inquiry - Assignment of key functions, <i>TAST</i>:</p> <div data-bbox="411 387 568 461">EHER</div> <div data-bbox="579 387 635 495">   </div> <div data-bbox="651 387 807 461">LI.12</div> <div data-bbox="818 387 874 495">   </div> <div data-bbox="898 387 1054 461">TARA</div> <div data-bbox="1066 387 1121 495">   </div> <div data-bbox="1137 409 1294 461">no</div> <div data-bbox="1321 409 1369 461">P</div> <p>Here, you can enter for the operating mode either a MIN/MAX value inquiry, a threshold value correction or a tara-function on the navigation keys. If the MIN/MAX memory is activated with EHER, the measured MIN/MAX values will be saved during operation and can be called up via the navigation keys [▲] [▼]. The values are lost if the device is restarted. If the threshold value correction LI.1 is selected, the limit values can be changed during operation without hindering the operating procedure. With the tara-function the device can be set on a temporarily parameterized value. This function is activated by pushing the 2 navigation keys [▼] [▲] simultaneously. The device receipts the correct taring by showing "0000" in the display. If NO is parameterized, the navigation keys [▼] [▲] have no function in operating mode.</p>
<div data-bbox="124 1025 280 1077">FLAS</div> <div data-bbox="308 1025 355 1077">P</div> <div data-bbox="135 1104 276 1211">  </div>	<p>4.3.2. Flashing of display, <i>FLAS</i>:</p> <div data-bbox="411 1014 568 1088">LI-1</div> <div data-bbox="579 992 635 1099">   </div> <div data-bbox="651 1014 807 1088">LI-2</div> <div data-bbox="818 992 874 1099">   </div> <div data-bbox="898 1014 1054 1088">LI.12</div> <div data-bbox="1066 992 1121 1099">   </div> <div data-bbox="1137 1014 1294 1088">no</div> <div data-bbox="1321 1014 1369 1088">P</div> <p>Here, flashing of the display can be added as an extra alarm function, either to the first limit value (select: LI-1), the second limit value (select: LI-2) or to both limit values (select: LI-12). With NO (works setting), no flashing is assigned at all.</p>
<div data-bbox="124 1339 280 1391">LI-1</div> <div data-bbox="308 1339 355 1391">P</div> <div data-bbox="135 1395 276 1503">  </div>	<p>4.3.3. Limit values / Limits, <i>LI-1</i>:</p> <div data-bbox="411 1339 459 1391">0</div> <div data-bbox="491 1339 539 1391">P</div> <div data-bbox="571 1339 619 1391">0</div> <div data-bbox="651 1339 699 1391">P</div> <div data-bbox="730 1339 778 1391">0</div> <div data-bbox="810 1339 858 1391">P</div> <div data-bbox="890 1339 938 1391">0</div> <div data-bbox="970 1339 1018 1391">P</div> <div data-bbox="1050 1305 1098 1413">   </div> <div data-bbox="1114 1339 1161 1391">P</div> <p>For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after the other.</p>
<div data-bbox="124 1619 280 1671">HY-1</div> <div data-bbox="308 1619 355 1671">P</div> <div data-bbox="135 1675 276 1783">  </div>	<p>Hysteresis for limit values, <i>HY-1</i>:</p> <div data-bbox="411 1619 459 1671">0</div> <div data-bbox="491 1619 539 1671">P</div> <div data-bbox="571 1619 619 1671">0</div> <div data-bbox="651 1619 699 1671">P</div> <div data-bbox="730 1619 778 1671">0</div> <div data-bbox="810 1619 858 1671">P</div> <div data-bbox="890 1619 938 1671">0</div> <div data-bbox="970 1619 1018 1671">P</div> <div data-bbox="1050 1585 1098 1693">   </div> <div data-bbox="1114 1619 1161 1671">P</div> <p>For all limit values, a hysteresis function exists that reacts according to the settings (threshold exceedance / threshold undercut).</p>

Menu level	Parameterization level
	<p>Function if display falls below / exceeds limit value, FU-1:</p> <p>FU-1 P HIGH  LOW  P</p> <p>The limit value undercut can be selected with LOW (LOW = lower limit value) and limit value exceedance can be selected with HIGH (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function „HIGH“, the alarm will be activated by reaching the threshold. If the limit value is allocated to „LOW“, an alarm will be activated by undercut of the threshold.</p>
	<p>Limit value /Limits, LI-2:</p> <p>LI-2 P 0 P 0 P 0 P 0  P</p> <p>For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after the other.</p>
	<p>Hysteresis for limit values, HY-2:</p> <p>HY-2 P 0 P 0 P 0 P 0  P</p> <p>For all limit values, a hysteresis function exists that reacts according to the settings (threshold exceedance / threshold undercut).</p>
	<p>Function if display falls below / exceeds limit value, FU-2:</p> <p>FU-2 P HIGH  LOW  P</p> <p>To indicate if the value falls below the lower limit value, LOW can be selected (LOW = lower limit value) and if it goes above the upper limit value, HIGH can be selected (HIGH = upper limit value). LOW corresponds to the quiescent current principle and HIGH to the operating current principle.</p>
	<p>Setting the code, CODE:</p> <p>CODE P 1 P 2 P 3 P 4  P</p> <p>With this setting, it is possible to select an individual code (works setting 1 2 3 4) for locking the keyboard. To lock/release the key, proceed according to menu item RUN.</p>

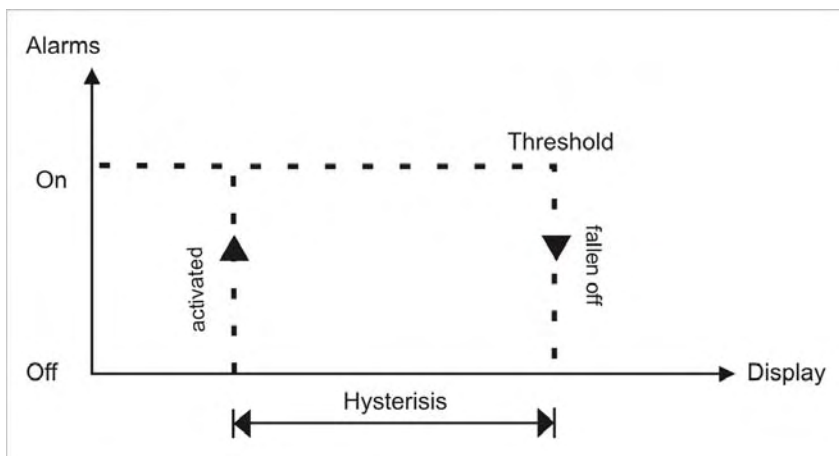
Menu level	Parameterization level
	<p>4.3.4. Set points - Number of additional set points, <i>SPCT</i>:</p>  <p>In addition to the start and end value, 8 extra set points can be defined to linearize non-linear sensor values. Only the activated set point parameters are displayed.</p>
	<p>Display values for set points <i>DIS1 ... DIS5</i>:</p>  <p>Under this parameter the setpoints are defined on a value basis. At the sensor calibration one will be asked at the end (like at Endwert/Offset, too), if a calibration shall be triggered.</p>
	<p>Analogue values for set points <i>INP1 ... INP8</i>:</p>  <p>Setpoints are only displayed under works calibration (4-20 mA). Here you can choose your analog values. The entry of constantly rising values need to be done self-contained.</p>

Functional principle of the set points



Limit value exceedance “HIGH”

By limit value exceedance the alarm S1-S2 is off below the threshold and on on reaching the threshold.



Limit value undercut “LOW”

By limit value undercut the alarm S1-S2 is on below the threshold and switched off on reaching the threshold.

Alarms / optical setpoint display

An activated set point can be optically indicated by flashing of the 7-segment display.

Functional principle of the alarms	
Alarm	Deactivated, display value
Threshold	Threshold/limit value for switch over
Hysteresis	Width of the window between the thresholds
Function	Limit value exceedance / limit value undercut

5. Factory settings

5.1. Default values

Parameter	Menu items				Default
TYPE	0-10	SENS	0-20	4-20	SENS
End	4999	to	9999		1000
OFFS	4999	to	9999		0000
dot	0000	to	0.000		0
SEC	0.1	to	10.0		0.10
run	ULOC		LOC		ULOC
OFFR	49.99	to	99.99		
EndR	49.99	to	99.99		
tarA	4999	to	9999		0
zer0	00	to	99		0
last	no	EXtr	L1.12	tarA	no
FLAS	no	L1-1	L1-2	L1.12	no
L1-1	4999	to	9999		0200
HY-1	0000	to	9999		0000
Fu-1	LOW	HI	9H		HI 9H
L1-2	4999	to	9999		0300
HY-2	0000	to	9999		0000
Fu-2	LOW	HI	9H		HI 9H
Code	0000	to	9999		1234
SPCt	0	to	8		0
diS1	4999	to	9999		
inp1	4999	to	9999		
diS2	4999	to	9999		
inp2	4999	to	9999		
diS3	4999	to	9999		
inp3	4999	to	9999		
diS4	4999	to	9999		
inp4	4999	to	9999		
diS5	4999	to	9999		
inp5	4999	to	9999		
diS6	4999	to	9999		
inp6	4999	to	9999		

Parameter	Menu items				Default
d1 S7	4999	to	9999		
l nP7	4999	to	9999		
d1 S8	4999	to	9999		
l nP8	4999	to	9999		

5.2. Reset to default values

To return the unit to a **defined basic state**, a reset can be carried out to the default values.

The following procedure should be used:

- Switch off the power supply
- Press button **[P]**
- Switch on voltage supply and press **[P]**-button until „- - - -“ is shown in the display.

With reset, the default values of the program table are loaded and used for subsequent operation. This puts the unit back to the state in which it was supplied.

Caution! All application-related data are lost.

6. Technical data

Housing				
Dimensions				
96x24		96x24x60 mm (BxHxT)		
		96x24x74 mm (BxHxT) including plug-in terminal		
Panel cut-out				
96x24		92.0 ^{+0.8} x 22.2 ^{+0.3} mm		
Insulation thickness		up to 3 mm		
Fixing		snap-in screw element		
Material		PC Polycarbonate, black, UL94V-0		
Sealing material		EPDM, 65 Shore, black		
Protection class		standard IP65 (front), IP00 (back side)		
Weight		approx. 200 g		
Connection		plug-in terminal; wire cross section up to 2.5 mm ²		
Display				
Digit height		14 mm		
Segment colour		red		
Display range		-1999 bis 9999		
Setpoints		optical display flashing		
Overflow		horizontal bars at the top		
Underflow		horizontal bars at the bottom		
Display time		0.1 to 10.0 seconds		
Input	Measuring range	Ri	Measuring fault	Digit
min. -22...max. 24 mA	0/4 – 20 mA	~ 100 Ω	0.1 % of measuring range	±1
min. -12...max. 12 VDC	0-10 VDC	~ 200 kΩ	0.1 % of measuring range	±1
Temperature drift		100 ppm / K		
Measuring time		0.1...10.0 seconds		
Measuring principle		U/F-conversion		
Resolution		approx. 18 Bit at 1s measuring time		
Power pack		230 VAC +/- 10 % max. 6 VA 24 VDC +/- 10 % max. 1 VA		
Memory		EEPROM		
Data life		≥ 100 years		

Ambient conditions	
Working temperature	0...60°C
Storing temperature	-20...80°C
Weathering resistance	relative humidity 0-80% on years average without dew
EMV	EN 61326
CE-sign	Conformity to directive 2004/108/EG
Safety standard	According to low voltage directive 2006/95/EG EN 61010; EN 60664-1

7. Safety advice

Please read the following safety advice and the assembly *chapter 1* before installation and keep it for future reference.

Proper use

The **M1-device** is designed for the evaluation and display of sensor signals.



Danger! Careless use or improper operation can result in personal injury and/or damage to the equipment.

Control of the device

The panel meters are checked before dispatch and sent out in perfect condition. Should there be any visible damage, we recommend close examination of the packaging. Please inform the supplier immediately of any damage.



Installation

The **M1-device** must be installed by a suitably **qualified specialist** (e.g. with a qualification in industrial electronics).

Notes on installation

- There must be no magnetic or electric fields in the vicinity of the device, e.g. due to transformers, mobile phones or electrostatic discharge.
- The **fuse rating** of the supply voltage should not exceed a value of **6A N.B. fuse**.
- Do not install **inductive consumers** (relays, solenoid valves etc.) near the device and **suppress** any interference with the aid of RC spark extinguishing combinations or free-wheeling diodes.
- Keep input, output and supply lines separate from one another and do not lay them parallel with each other. Position “go” and “return lines” next to one another. Where possible use twisted pair. So, you receive best measuring results.
- Screen off and twist sensor lines. Do not lay current-carrying lines in the vicinity. Connect the **screening on one side** on a suitable potential equaliser (normally signal ground).
- The device is not suitable for installation in areas where there is a risk of explosion.
- Any electrical connection deviating from the connection diagram can endanger human life and/or can destroy the equipment.
- The terminal area of the devices is part of the service. Here electrostatic discharge needs to be avoided. Attention! High voltages can cause dangerous body currents.
- Galvanic insulated potentials within one complex need to be placed on a appropriate point (normally earth or machines ground). So, a lower disturbance sensibility against impacted energy can be reached and dangerous potentials, that can occur on long lines or due to faulty wiring, can be avoided.

8. Error elimination

	Error description	Measures
1.	<p>The unit permanently indicates overflow.</p> 	<ul style="list-style-type: none"> • The input has a very high measurement, check the measuring circuit. • With a selected input with a low voltage signal, it is only connected on one side or the input is open. • Not all of the activated setpoints are parameterised. Check if the relevant parameters are adjusted correctly.
2.	<p>The unit permanently shows underflow.</p> 	<ul style="list-style-type: none"> • The input has a very low measurement, check the measuring circuit . • With a selected input with a low voltage signal, it is only connected on one side or the input is open. • Not all of the activated setpoints are parameterised. Check if the relevant parameters are adjusted correctly.
3.	<p>The word "HELP" lights up in the 7-segment display.</p>	<ul style="list-style-type: none"> • The unit has found an error in the configuration memory. Perform a reset on the default values and re-configure the unit according to your application.
4.	<p>Program numbers for parameterising of the input are not accessible.</p>	<ul style="list-style-type: none"> • Programming lock is activated • Enter correct code
5.	<p>"ERR" lights up in the 7-segment display</p>	<ul style="list-style-type: none"> • Please contact the manufacturer if errors of this kind occur.
6.	<p>The device does not react as expected.</p>	<ul style="list-style-type: none"> • If you are not sure if the device has been parameterised before, then follow the steps as written in <i>chapter 5.2.</i> and set it back to its delivery status.
